Report

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Introduction

The invasion of *Calluna vulgaris* (heather) in Tongariro National Park poses a significant ecological threat, displacing native flora and disrupting the local ecosystem. The New Zealand Defence Force (NZDF) has implemented an experimental study to assess the effectiveness of various management treatments aimed at reducing heather coverage and promoting the growth of native vegetation. This report analyzes the data collected from the experiment to recommend the most effective treatment.

Methodology

The experiment was designed as a Randomised Complete Block Design (RCBD), where similar "blocks" (areas of land) were subjected to four different treatments: Control (C), Herbicide (H), Beetles (B), and a combination of Herbicide and Beetles (HB). This method ensures that environmental factors like soil type and climate do not confound the results.

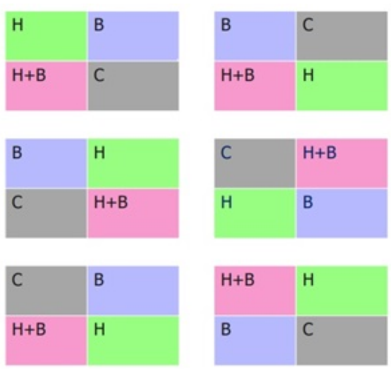
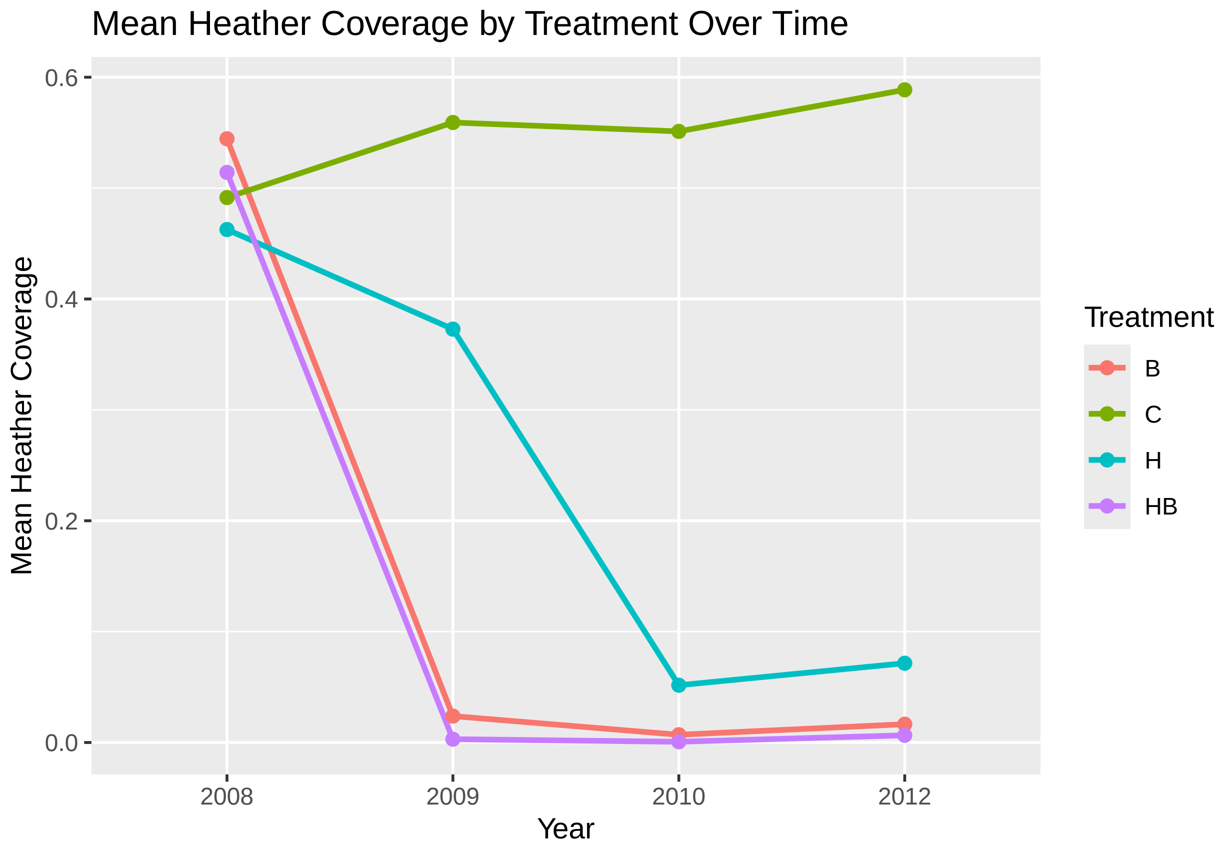


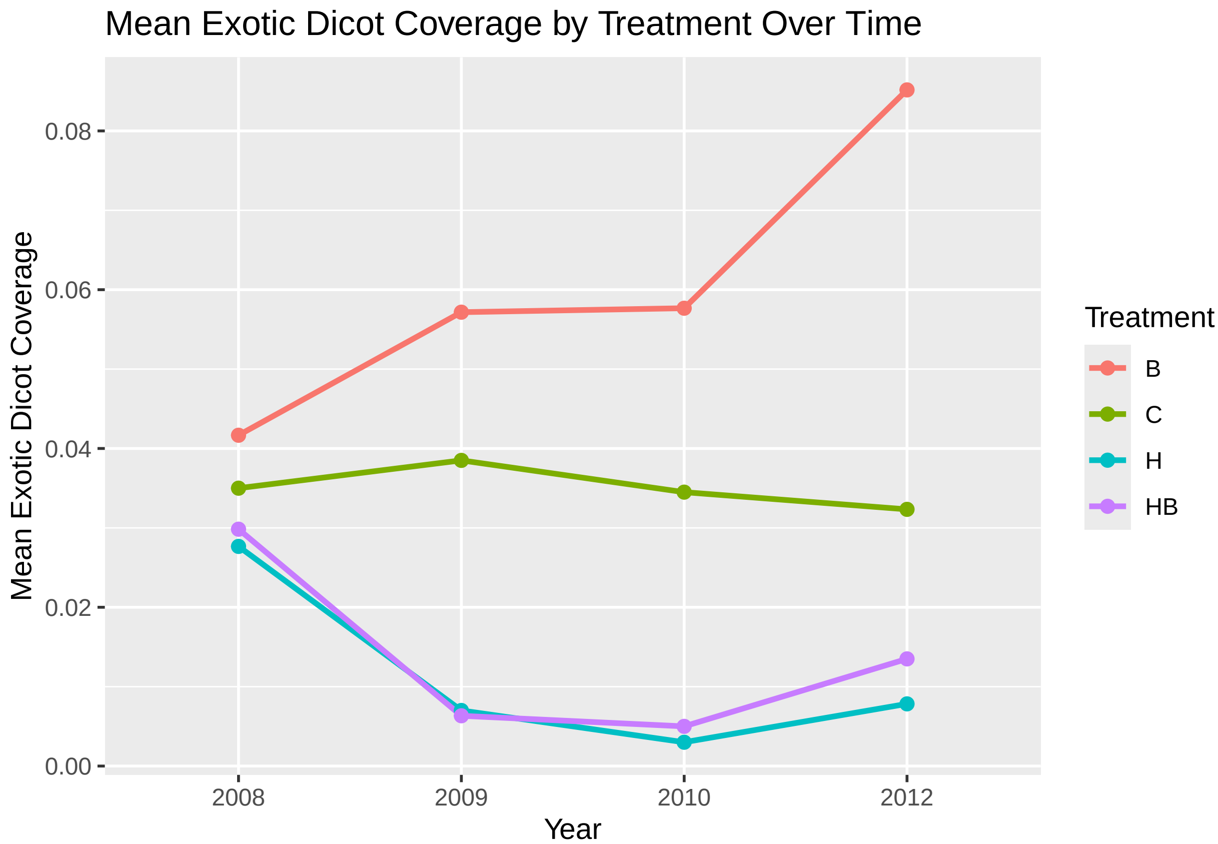
Figure 1: Randomised Complete Block Design (RCBD)

We employed a one-way ANOVA with blocking to compare the mean coverage of heather across different treatments. Additionally, a two-way ANOVA was conducted to investigate the interaction between treatment and year, allowing us to assess how these factors influenced the ground cover of both native and invasive species over time.

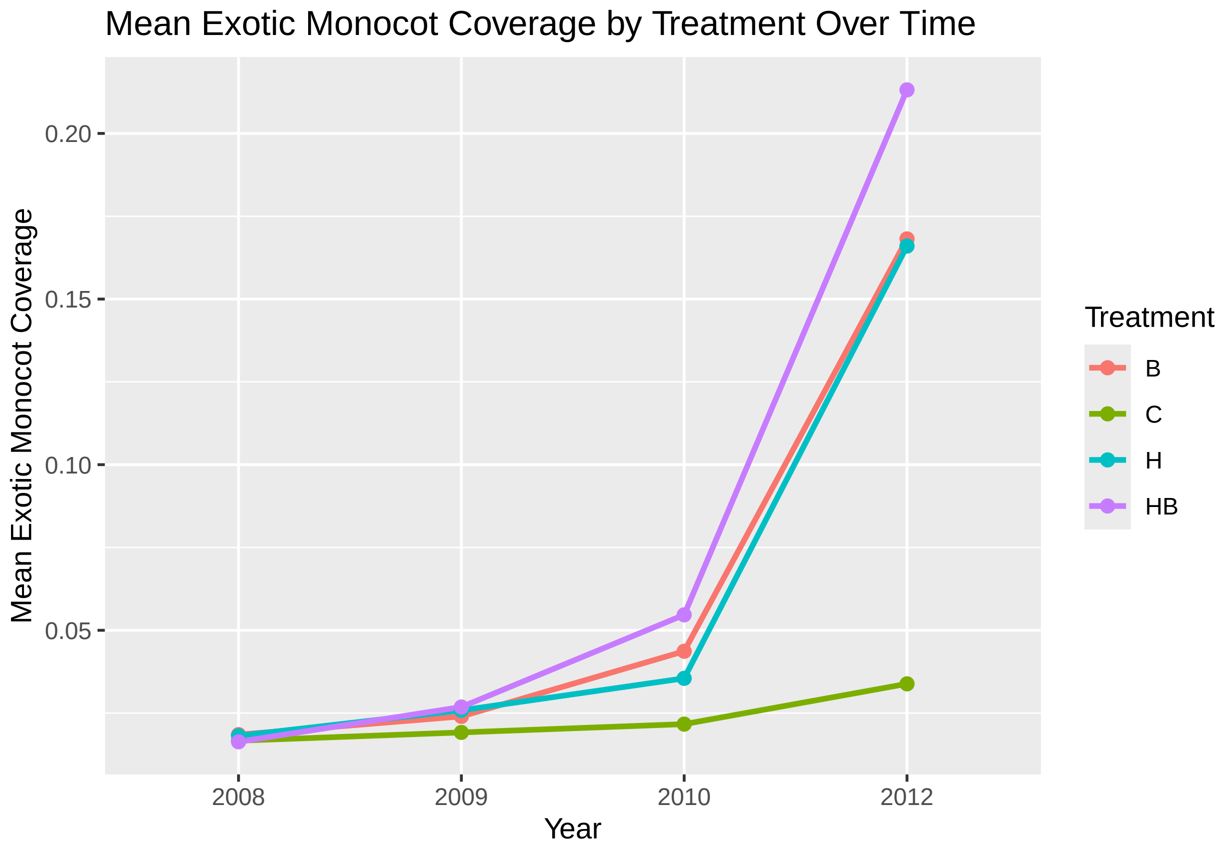
Results



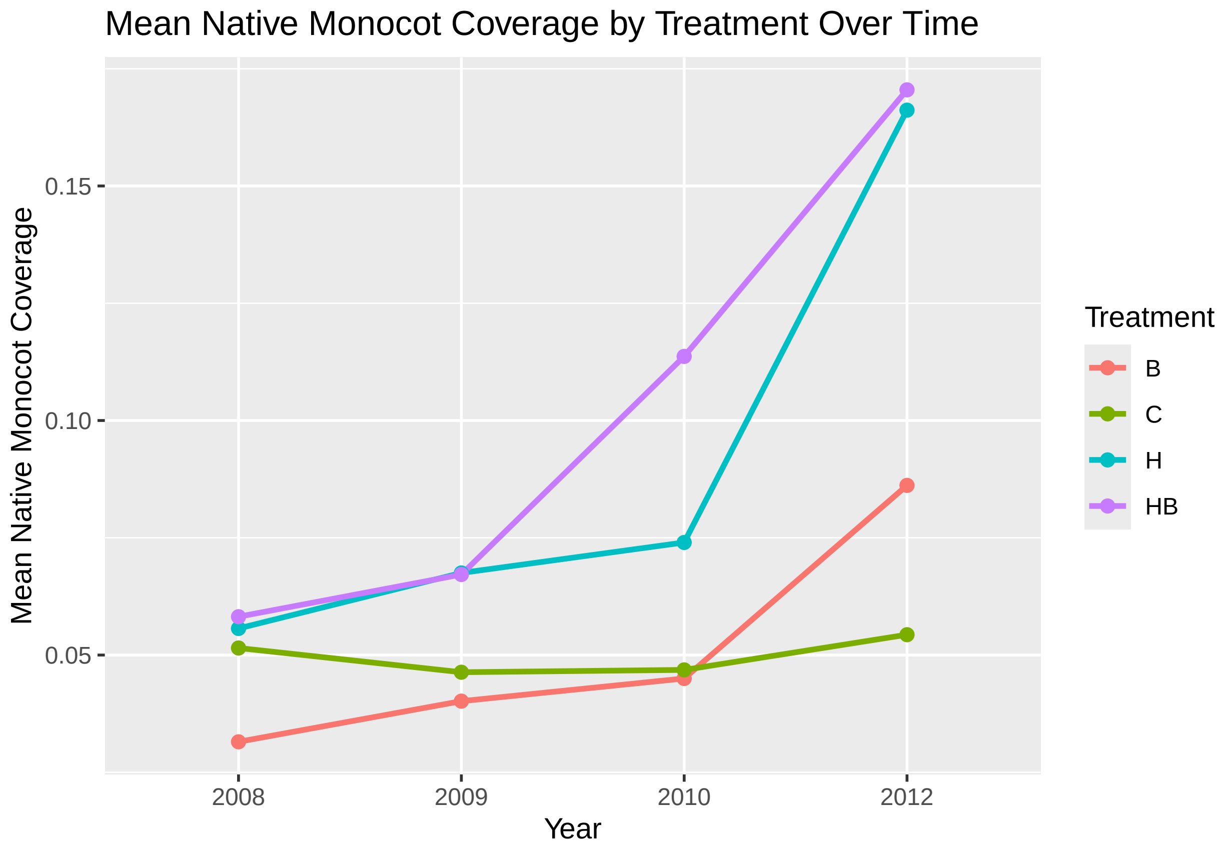
The results for Heather coverage over time indicate that the Herbicide + Beetles (HB) treatment is the most effective in reducing Heather coverage, followed by Beetles (B) alone, and then Herbicide (H). The Control (C) group showed no significant changes across the years.



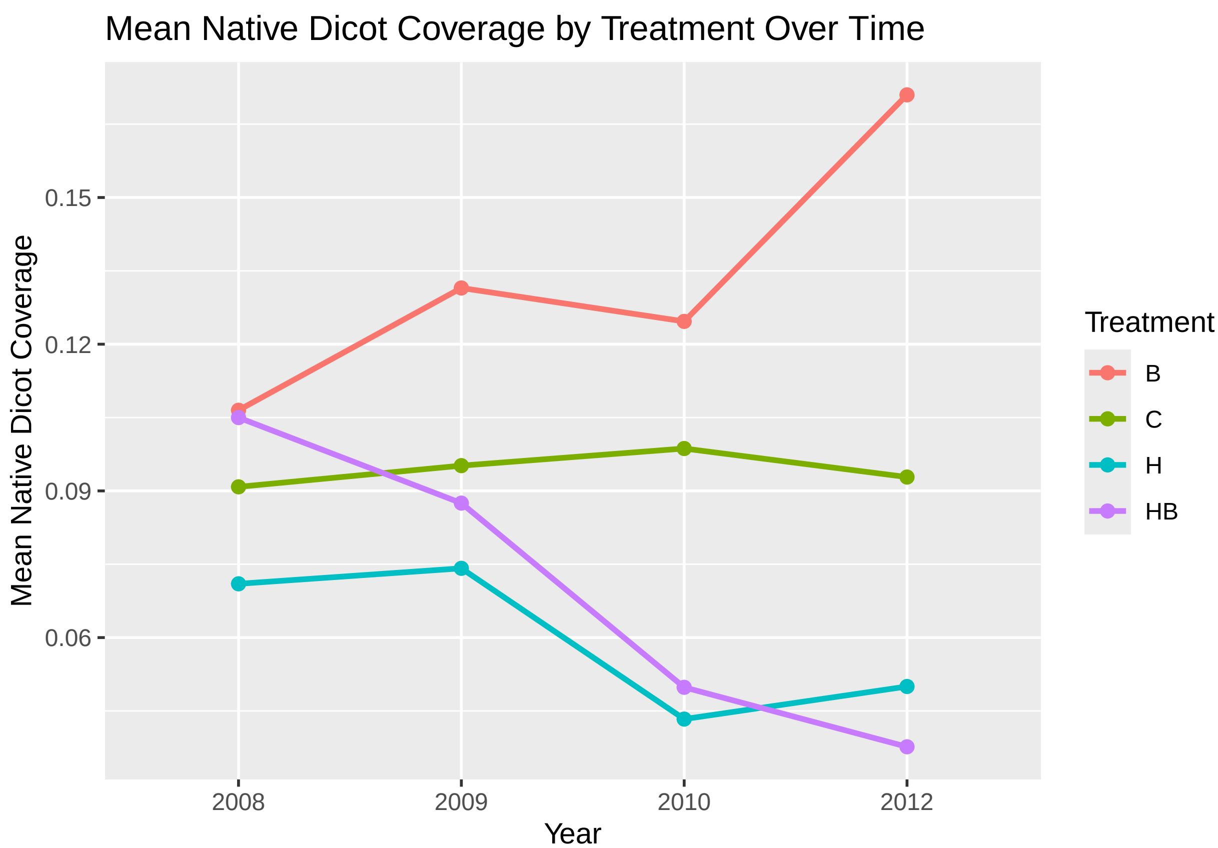
For Exotic Dicots, all treatments increased their coverage, with the HB treatment leading to the least increase.



Exotic Monocots increased under all treatments, with the least increase observed in the Control group.



Native Monocots showed the most positive response to the HB treatment, followed by the Herbicide (H) treatment.



The Beetles (B) treatment was most effective in promoting Native Dicots, while the HB treatment slightly decreased their coverage.

Conclusion and Recommendation

We recommend that the NZDF adopts the Biocide Beetle treatment. This method has the most positive impact on reducing Heather while supporting the growth of native plants. It effectively promotes the increase of Native Dicots without causing a significant rise in Exotic Dicots. This is also a natural approach, avoiding the use of chemicals and reducing potential ecological risks.

Strengths and Weaknesses of the Analysis

Strengths:

The use of RCBD controls for environmental variability, providing a robust comparison between treatments. ANOVA allows for an understanding of interactions between treatment and time, crucial for ecological studies.

Weaknesses:

The increase in exotic monocots under the B and HB treatment highlights a potential trade-off that wasn't fully addressed in the study design. No treatment positively impacts all aims. Further analysis may be needed to explore long-term effects and integrate treatments to control exotic species.